

Empirical and Molecular Formulas

- Believe it or not, there is more than one kind of chemical formula
- Judging from the heading of this section, they would be **empirical** and **molecular** formulas.

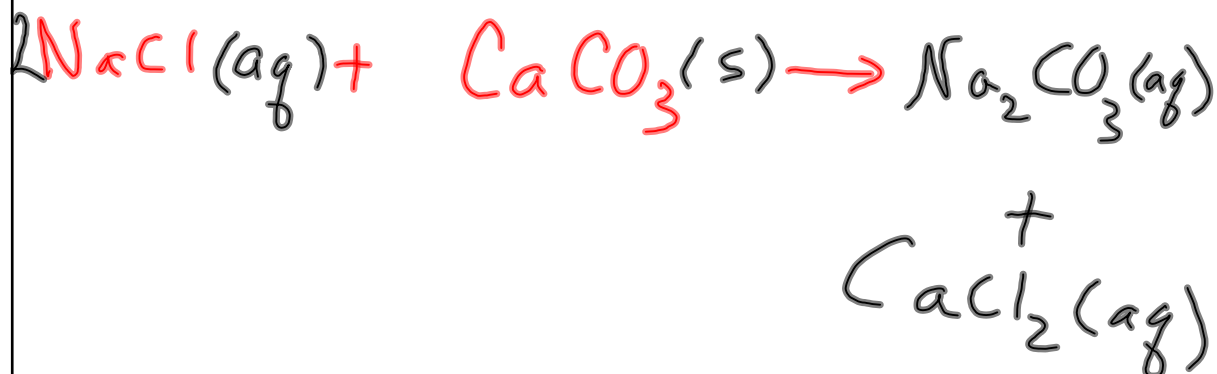
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Empirical and Molecular Formulas

- **Empirical formulas** give the lowest whole number ratio of the atoms in a compound
- **Molecular formulas** give the exact composition of one molecule of a compound.

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Demo Solubility



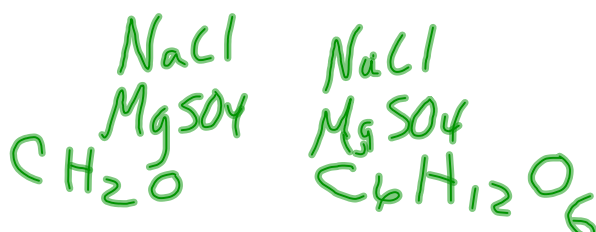
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Empirical and Molecular Formulas

- Examples Empirical Molecular (True)



- | | |
|-------------------|-------------------------------|
| • HO | H ₂ O ₂ |
| • <u>CH</u> | C ₂ H ₂ |
| • <u>CH</u> | C ₆ H ₆ |
| • NO | NO |
| • NO ₂ | N ₂ O ₄ |



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Calculating Empirical Formulas

- Empirical formulas can be calculated using experimental data:

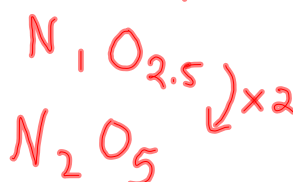
- Given that a certain compound is 25.9% nitrogen and 74.1% oxygen, calculate the empirical formula of this compound.

① Change % to mass N 25.9g / 14.01g/mol = 1.849

② Change mass to mol O 74.1g / 16.00g/mol = 4.631

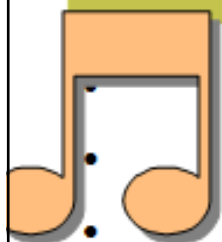
③ ÷ by the Smallest Subscript
$$\frac{N_{1.849} O_{4.631}}{1.849}$$

- ④ x until you get a whole #



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Calculating Empirical Formulas



Percent to mass...

mass to mole....

divide by small...

multiply till whole....



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